The use of irrigation water during transition in Bulgaria's Plovdiv region

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THE USE OF IRRIGATION WATER DURING TRANSITION IN BULGARIA'S PLOVDIV REGION

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ABSTRACT

The amount of water used for irrigation has sharply declined during transition in Bulgaria. Large sections of existing irrigation systems were abandoned, and the ones still in use are barely maintained. Crops such as wheat and barley have replaced more water-intensive crops, including vegetables, rice and maize. This problem has an impact on the future development of agriculture and the allocation of the country's water resources. The central argument is that land fragmentation in the wake of decollectivization and restitution contributes to the irrigation systems' abandonment. This paper concentrates on the institutional factors, but also considers additional factors, that may have influenced the process; further, it examines the causes driving these changes and analyses their effect on irrigation. It is based upon a review of relevant legislation, as well as field work in 17 villages located in the Plovdiv region of Bulgaria. The paper concludes that, in addition to changes in large-scale market forces and weakening of the state enforcement mechanism, institutional settings have contributed to the decline of irrigation in Bulgaria.

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1 INTRODUCTION

During transition, the amount of water used for irrigation in Bulgaria has sharply declined. In addition, the share of actually irrigated areas to those that can be irrigated is low. Large sections of existing irrigation systems lie abandoned, and the ones still in use are barely maintained. Crops such as wheat and barley have replaced more water-intensive crops, including vegetables, rise and maize. The central argument is that land fragmentation in the wake of de-collectivisation and restitution contributes to the irrigation systems' abandonment in Bulgaria.

This problem has an impact on the future development of agriculture and the allocation of the country's water resources. If the irrigation systems' water supply is not reliable, the farmers will switch to pump irrigation and in the long run this will affect ground water resources. In addition, if the systems are not maintained regularly, more water will be used, given the current level of production. Finally, the improper operation of the canals can result in water-logging and soil salinisation.

The literature devoted to irrigation and water usage (Ostrom; Vermillion) often emphasises the importance of institutional settings. Therefore, the paper focuses on the main institutional elements regarding water resources and irrigation The institutional settings include the existing governance structure and the property rights system. The governance structure elements investigated in the paper are: the water monitoring process, water pricing, and co-ordination and conflict resolution mechanisms. Important property rights in the case of irrigation are those regarding water, the infrastructure for water usage, and land.

Legal property rights were investigated by reviewing the relevant laws. The institutional settings in practice were investigated by conducting semi-structured interviews with the actors involved. These interviews were carried out in 17 villages located in one of the main agricultural regions in Bulgaria, around the town of Plovdiv. The research questions investigated in the paper are:

- How have land reform and the restructuring of irrigation initiated the process of irrigation systems' abandonment in Bulgaria?
- How do current institutional settings affect the problem?
- Can factors other than institutional issues regarding water and irrigation systems also offer explanation?
- What is the local-level reaction to the problem?

2 THE PRIVATISATION PROCESS IN BULGARIAN AGRICULTURE

This section frames the situation and outlines the main elements of agrarian reform in Bulgaria. In addition, the formal legislation regarding water resources and infrastructure for water usage is discussed.

2.1 LAND RESTITUTION AND DISSOLUTION OF THE CO-OPERATIVES

During socialism, large production units (Co-operatives and Agro-industrial Complexes) organised agricultural production in Bulgaria. Private farming was allowed only on small plots, but even then, individual farmers were dependent on the co-operatives for input supply and output realisation.

Land reform was initiated in the beginning of 1991 when the Land Law was approved by parliament. This law, and the rules for its implementation, specified the mechanisms for the liquidation of co-operatives and the reallocation of agricultural land to individual owners. Land in Bulgaria was never nationalised; therefore, from a legal point of view, this land reform is actually an act of restitution. The ownership of land parcels was restored to the previous owners, or their inheritors, in the real or comparable boundaries that existed before collectivisation during the 1950s.

Table 1. **Private farms in Bulgaria according to size**

Arable land	Number of Private Farmers	%	Total Area ha	%	Average Size ha
Up to 0.2 ha.	915217	51.5	83101.7	3.2	0.09
0.2 - 0.5 ha.	363564	20.4	118412.8	4.5	0.33
0.5 – 1 ha.	256442	14.4	180535.2	6.9	0.70
1-2 ha.	156473	8.8	214634.0	8.2	1.37
2 –5 ha.	68474	3.9	205148.1	7.8	2.99
5-10 ha.	13446	0.8	90299.3	3.5	6.72
Above 10 ha.	3506	0.2	1728427.0	65.9	492.99
Total	1777122	100 %	2620558.1	100 %	1.48

Source: The Agrarian Report, 1999

Pre-collectivisation land ownership in Bulgaria was highly fragmented and the restitution process deepened this problem even further. The landowners from 1950 had grown too old to farm, and some had passed away. In addition, many of them had several inheritors, now living in the towns, with little or no experience in agriculture and no ambition to return to the villages.

Soon after the co-operatives were abolished, new producer co-operatives were established in almost all villages[1]. The opportunities for establishing private farms were constrained by traditions, land fragmentation and a lack of resources. Moreover, frequent changes in legislation and the decline of the food processing industry created high uncertainty and further hindered the development of stable production units.

The land restitution process was slow and contradictory. At the end of land reform in the year 2000, Bulgarian farm structure was dominated by three groups: small subsistent farms operated by people close to retirement, co-operatives, most of them in bad financial situation, and large commercial farms. The number of middle-size family farms remained small.

[1] For a more detailed description and analysis of the land restitution process and the fate of the co-operatives, see Davidova et al. 1997.

2.2 THE REORGANISATION OF IRRIGATION

Irrigation is very important for Bulgarian agriculture, but until the end of the Second World War only a small part of the land was irrigated. During the1960s, the state initiated an extensive program to increase irrigated areas. Since co-operatives were then the dominant organisational form, irrigation systems were designed to supply water to large production units. The main sources of water supply were large dams located in the mountains, and rivers. Ground water was used as a complementary source. In 1990, the total irrigated land was about 1,200,000 hectares.

The process of reorganising irrigation started in the beginning of 1999 after the parliament approved the Water Law. In 2001, two additional acts were issued, the Water Users Association Law and the Organisational Rules of the Melioration Executive Agency. These three documents form the backbone of irrigation reform. They specify the legal property rights to water, the irrigation infrastructure, and also define main organisational rules.

Irrigation reform started when the land restitution process was approaching its end. The investments in irrigation systems are site and capital specific. Therefore, it is reasonable to expect that eventually this may have caused the problem. In Germany (Schleyer 2001), and Litva (Busmanis 2001), however, where both processes were carried out faster than in Bulgaria and nearly at the same time, the phenomenon of abandonment of the irrigation and drainage systems was also observed. Therefore, there are other factors different than the time separation that have influenced the process.

2.3 LEGAL PROPERTY RIGHTS AND MANAGEMENT OF WATER RESOURCES AND IRRIGATION SYSTEMS

The Water Law, passed in 1999, granted state, municipal, and private ownership to water resources. Some exceptions are spring water, rivers, ground water, and natural lakes located in state owned land; these are owned exclusively by the state. Spring water and natural lakes in community-owned land are considered municipal property.

Private ownership is allowed only for water located in private land: wells, springs within property borders, and artificial or natural lakes that are not fed by water sources from state or communal property. Landowners can use water from wells free of charge up to certain limit[2], above which they must apply for permission and pay tax. In addition, all wells must be registered in the local municipality.

The law also specifies sanctions in cases where: water resources are used without required permission[3], water control rules are violated, irrigation infrastructure is damaged, water usage rules are violated, and water resources are polluted.

Three ministries own and manage the water infrastructure. The Ministry of Agriculture and Forestry is responsible for the irrigation systems (the main canals and some of the large dam-lakes). The management of these holdings is conducted by the state firm Irrigation Systems, Ltd. The Ministry of Regional Development is responsible for household water supply. The Energy Committee is responsible for the electric power stations

[2] 10 m^3 for 24 hours and not more that 0,2 litres per second (art 43, line 2,3,4).

[3] The fine varies according the level of water usage.

and the large water dams. The internal canal system and some small dams are intended to be transferred to water users' associations.

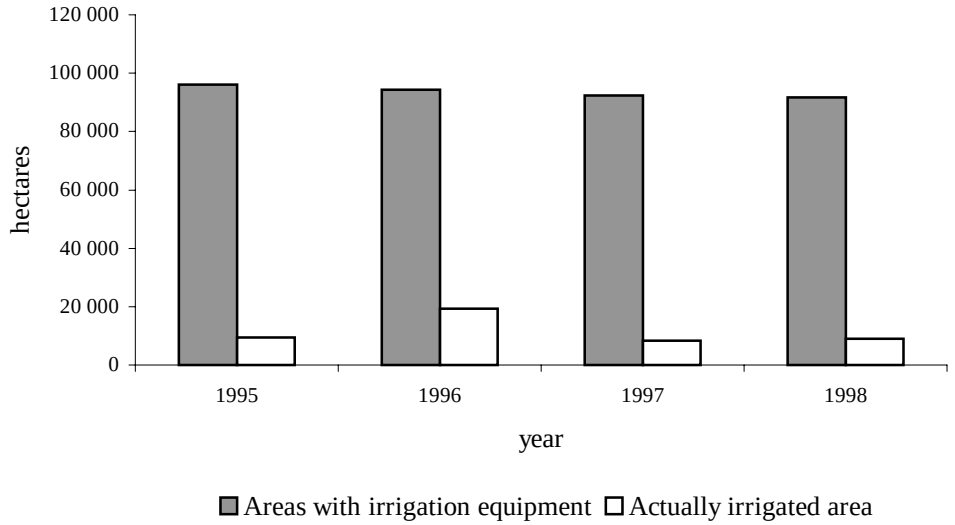
At the national level, the Ministry of Environment and Water conducts water management. At the regional level, Basins Offices are supposed to co-ordinate water usage activities. The Water Law specifies four water regions. At the beginning of the year 2000, however, none of these offices had been established.

In summary, land restitution in Bulgaria has led to land fragmentation. Co-operatives, which co-ordinated not only agricultural activity, but also the village's social life, were abolished before alternative forms emerged. Formal legislation regarding irrigation is already in place, but some of the structures have yet to be established.

3 THE PLOVDIV REGION

In order to investigate the problem of irrigation system abandonment at the local level, interviews were conducted in the Plovdiv region. This region is located in the western part of the Trakia plain[4] along the Maritza river. The main crops grown in the area are fruits, vegetables and rice. The region is rich in water resources. Maritza is the biggest Bulgarian river and about 40% of all the country's ground water resources are located here. Irrigation systems are built on 80 % of the agricultural land; however, during the last several years most of them haven't operated. There are four large[5] and 263 small water dams.

Figure 1: Irrigation in the Plovdiv agricultural region



Source: Regional Agriculture Office

[4] The average temperature of the Trakia Plain ranges from about 0^0 C in January to about 24^0C in July. Average rainfall is about 500-600 mm. The average temperature of the Plovdiv region is $12C^o$, humidity is 72%, and the average rainfall- 532mm. Droughts are common during the summer months.

[5] Piasacnik, Domlian, Wutcha, and Kricim water dams.

Interviews were carried out in 17 villages, (1) located in different parts of the region and (2) supplied with water from different sources. In each village, an interview was first conducted with the Mayor[6]. Then, 2-6 (depending on the size of the village and the difficulties associated with co-ordination) semi-structured interviews were conducted with randomly selected individual agricultural producers.

The firm Irrigation Systems, Ltd. has two branches in the area. The first one, Irrigation Systems, Ltd. - Plovdiv-North, organises the water supply north of the Maritza River where most of the rice production is located. The second branch, Irrigation Systems, Ltd. - Plovdiv-South, serves the area south of the river. Small agricultural producers dominate this region.

The Union of Rice Producers is an organisation of farmers and processors involved in the rice industry. Rice producers are among the biggest and most organised water users in the Plovdiv region. A interview was conducted with the secretary of this union.

The development of water users associations in the region was supported by the Ministry of Agriculture and Forestry and the Word Bank. Currently, they operate under Co-operative or Trade laws. Interviews were conducted with representatives of four of them.

The final sample is comprised of 49 interviews, including 3 producer co-operatives, 3 large rice producers, 2 water dam tenants and 4 water users' associations; the rest are individual producers.

4 INSTITUTIONAL SETTINGS IN PRACTICE

The institutional settings include the existing governance structure and property rights system. The governance structure determines (1) how transactions happen, on the market, in a hierarchy, or in hybrid forms, and (2) the factors that influence the process (Sikor and Hagedorn 2001). The property rights structure includes not only the formal, but also all informal arrangements[7]. They "…..determine the distribution of cost and benefit streams originating from the nature resources." (Sikor and Hagedorn 2001).

4.1 GOVERNANCE PROBLEMS

Water is supplied through a hierarchy by the firm Irrigation Systems, Ltd. This firm enjoys a state monopoly in irrigation. Presently, co-operation is weakly developed at the village level. The market, in terms of trading water rights or quotas is non-existent.

Drawing from Ostrom (1992), in this paper the following factors of governance structures are investigated: existing monitoring system, pricing mechanisms, co-ordination, conflict resolution and sanction mechanisms.

Monitoring system. Before transition, the quantity of water used was measured at the main canal exits. The co-operatives were then responsible for water usage on their terri-

[6] The Mayors, especially in small villages are also agricultural producers. Because of their position they are able to provide overview of the area.

[7] Informal arrangements could be considered as an indicator for effectiveness of the formal rules.

tory, and paid according to the readings of water-meters. During transition, the water is still being measured at the official main canal exits. However, in many places the canals are deliberately broken by water users and the water flows in their plots.

According to the manager of Irrigation Systems, Ltd. – Plovdiv-North, stealing water is not a big problem for the firm; water is cheap and only small producers can do it without being noticed. The main problems regarding the main canals, according to him, are the high-water losses in the systems and the stealing of irrigation equipment. These two factors are a serious threat to the water supply in his region. Water guards control the main canals; however, according to farmers and the managers of Irrigation Systems, Ltd., they are considered inadequate for the area they serve.

According to the manager of Irrigation Systems, Ltd., - Plovdiv-South, stealing water is a problem that affects water supply in the south region even though it is done mainly by small producers: "…..they are small but many, and the monitoring is expensive[8]……" . According to him, small producers not only steal water from the firm, but they also disturb the water supply to large producers. He also considers protecting irrigation equipment to be a serious problem.

The reason for the difference in opinion of the two managers is the structure of production and the type of farms in both regions. Rice production is prominent in the northern area, and in addition the farmers cultivate larger plots; this ensures some comparatively stable revenue to the firm in the north region. In the south region, most of the water users are small.

Internal canal systems are rarely guarded and water is not monitored. Agricultural producers rarely participate in the monitoring process; they report the thieves only if water is scarce. Many of them live by the rule, "Do not get into a conflict with your neighbour."

***Water pricing mechanism*.** The local branches of Irrigation Systems. Ltd. calculate average prices per cubic meter of water. The water price[9] is determined by two factors, operation cost and area expected to be irrigated. Then, these prices are presented for approval in the central office of the firm in Sofia. Being corrected, the prices are returned back to the local branches. The water price is below the delivery cost, and the firm receives subsidies from the State.

For large agricultural producers and water dam tenants, the water price is quoted per cubic meter. For small producers, because of difficulties in monitoring, it is quoted per hectare. Two factors determine the water price per hectare, per cubic meter water price and crops' watering norm[10]. The water price is doubled if an agricultural producer uses more than a certain level above the norms. The water users associations have certain

[8] A device for measuring the actual quantity of water used costs about 150 levs.

[9] Interview with the manager of Irrigation Systems, Ltd., Plovdiv North.

[10] Relative water requirements in cubic meter per hectare: Vegetables-3,000; Orchards-2,000; Corn-2,000; Rice-27,000.

privileges -lower prices[11]. Generally, only a few of the interviewed complained about the water price level in 2001. It was considered high, but reasonable.

Co-ordination. Irrigation Systems, Ltd. is obligated to supply water to agricultural producers who sign a contract and pay water fees. This system causes difficulties when only small areas need to be irrigated. Since per unit water-delivery costs are high and the price is predetermined, the firm incurs losses. To ease this problem, the manager of Irrigation Systems, Ltd, Plovdiv-South, is trying to collect more requests before releasing water in the canals. This strategy, though, is not always possible because agricultural producers in the area grow different crops that require irrigation at different times and also have different drought-resistances.

Water use timetables are prepared in many of the villages; however, they are often violated. Both people who pay, but more often people who do not pay, for the water violate them. After water is released in the internal canals, farmers have to protect it themselves. The one that is nearest to the canal very often has better chances.

***Conflict resolution*.** In case of a conflict, Irrigation Systems, Ltd. water guards, or local mayors, are expected to solve them. Water guards, however, avoid getting involved in conflicts because they are often local people, and also because they are supposed to serve a large area.

It is difficult to evaluate the role of water guards. In some villages, the interviewed stated that water rules violators do not respect the water guards and their orders (Komatevo, Kurtovo Konare, and Calapica). In this respect, an interesting idea was expressed by some of the interviewed (Komatevo, Calapica). According to them, only outsiders could impose effective control over water usage. In addition, they think that the water guards' salary should be connected with the water taxes they collect. In other villages, (Luben, Padarsko) the interviewed think that the water guards' orders are obeyed and they are doing a good job.

The manager of Irrigation Systems, Ltd., Plovdiv-South avoids hiring water guards from the local population. He also thinks that the law has not equipped the water guards with sufficient rights, and that this is a part of the problem. The water guards of the firm receive a salary. They are released from the job if the water tax collection in the area they are supposed to control is low.

Local mayors are representatives of the state in the villages. They are provided with the necessary resources for pursuing state and some regional policy. Solving conflicts concerning irrigation is not among their obligations. Very often the mayors are asked to solve conflicts since the local communities respect them. In such a situation, they act only as mediators who are trying to soften the conflicts, but do not have authority to impose decisions.

[11] For year 2001 the water prices per cubic meter were as follows (Irrigation Systems, Ltd.): for gravity irrigation 0.04 levs; for rice production 0.01 levs; and for pumped water 0.10 levs. For gravity irrigation the subsidy is 0.01 levs per cubic meter. Water users associations have certain privileges concerning water prices. They are charged per cubic meter for gravity irrigation - 0.02 levs and for pump-irrigation - 0.08 levs . The watering norms that are used for calculating price per hectare are recommended by Irrigation Systems, Ltd.

The social mechanisms for conflict resolution are underdeveloped; although fighting is very rare, the one who has more relatives or friends in the field usually wins the dispute.

Sanctioning mechanisms. Most of the interviewed did not know of anybody who was charged for violating the rules. However, several years ago in the village of Tcalapitca, some water users were taken to court by Irrigation Systems, Ltd. for not paying for water. Unfortunately, there was no information available about any court decisions.

According to the manager of Irrigation Systems, Ltd., Plovdiv - South, the process of bringing violators to court is long, expensive and inefficient. First, the water guards must detect the violation and then witnesses must certify it. Additionally, in most cases stealing water is done when there are no other people in the vicinity, or if there are, they do not want to get involved. Second, the court procedure is too long and the witnesses must testify again during the trial. Because of the time involved and also due to a number of other reasons (for example, the accused and the witnesses are neighbours), the witnesses often refuse to testify in court.

In 1998, the water users' association in the town of Rakovski was convicted by the courts for failure to pay for water. The manager of the association was not able to explain how this had happened, because he was not employed there during that time. Obviously, he was concerned with how to meet this obligation; the association had not worked for a profit, and now it didn't have the necessary resources. Therefore, the only way to solve this problem was to charge a higher water price, and hence transfer past obligations to the current period.

Irrigation Systems, Ltd. refuses to provide water to agricultural producers who have obligations leftover from previous years[12]. There are several reasons, however, which may limit the success of this strategy. First, it is difficult to exclude a violator from irrigation, especially when his plot has a favourable position to the canal system. In this case, the threat of the water supplier would not be credible. Second, if the whole branch of the system is isolated, the threat is credible, but the rest of agricultural producers would not be able to irrigate. The water supplier would lose revenues and clients in this case. Therefore, this strategy may be successful only for small irrigation systems or in a case of large water users.

In summary, the existing governance structure contributes to irrigation system abandonment. The monitoring system is somewhat developed for the main canals, but absent from the internal canals. In addition, stealing irrigation equipment and water is a problem. The unwillingness of the water users to participate in the monitoring process further deepens these problems.

Water prices are fixed regardless of the position and size of the plots. Small producers are charged per hectare, which lowers their incentives to participate in the monitoring process. Moreover, charging per hectare results in more water used compared with charging per cubic meter[13]. Land fragmentation causes co-ordination problems when

[12] Instructions for organising the irrigation process in 2001, Ministry of Agriculture.

[13] When priced per cubic meter, agricultural producers would equalise the value of water marginal product to the water price. When charged per hectares the producers would demand quantity of water until

only small areas need to be irrigated. This increases the cost for the water supplier and lowers its incentives to provide services to small producers

Conflict resolution mechanisms are poorly developed. The two actors expected to solve the problems are the water guards and the local mayors. Social mechanisms are nearly absent. The formal sanction mechanisms seem to work only in the case of large water users, but not in the case of small ones.

4.2 PROPERTY RIGHTS PROBLEMS

Following Hagedorn and Sikor (2001), the benchmark for investigating the structure of property rights in practice is who receives the benefits from a given property, and also who maintains it. Drawing from Vermillion, D. (1999), we look at the property rights system of water resources, the infrastructure for water usage, and land.

Water resources and infrastructure for water usage. Not one of the interviewed small farmers who was using water from wells or directly from a river was paying for it. The private wells had not been registered.

Irrigation Systems, Ltd., is legally responsible for the main canals. These canals are usable, but the losses in the systems are high. Additional investments are necessary to reduce water losses. The resources for investment are difficult to accumulate, because revenues from the irrigation systems are insufficient. The revenues from the systems are low partially because of the existing monitoring, conflict resolution, and sanctioning mechanisms.

Currently the internal canals are the responsibility of local municipalities. However, they are supposed to initially transfer the rights to manage the systems, and later their full property rights, to the water users' associations. Active water users associations, however, are still rare. In most of the villages where the interviews were conducted, the internal canal systems weren't maintained by local municipalities. Revenues from the local businesses were low or not even considerable. Financial resources from the state are not provided for the purpose of canal maintenance; moreover, in many places the canals were destroyed, and where operating, the water users maintained it.

The small water dams, as a part of the internal irrigation systems, are also the responsibility of local municipalities. Currently, individuals who are operating fisheries rent most of them, and the local municipalities receive the revenues. The tenants maintain the dams, but do not have the incentive to make long-term investments since they have 1-5 years contracts. These contracts would be terminated if a water users' association were created. Without these tenants, many of the small water dams would have been empty.

Land property rights. Most of the interviewed named land fragmentation as one of the main reasons for irrigation problems. Large parts of the internal canal systems which were passing through privately owned plots were destroyed. Land fragmentation will also constrain the implementation of the Water Users' Association Law. This law re-

the value of water marginal product reaches zero. The result is more water used compared with the first schema.

quires fifty plus one percent of the landowners or land users to participate in order to establish an association.

Therefore, the legal ownership of water and the main canal systems is partially exercised. Irrigation Systems, Ltd. bears a part of the costs and does not receive all possible revenues from the system. Formal property rights on the internal canal systems are not exercised. The local municipalities neither bear the costs nor receive benefits from them; only on rare occasion is this done by the water users. Land fragmentation further deepens the problem, since it prevents application of modern production technologies and therefore makes agricultural production less competitive. It also increases monitoring and transaction costs, and hence the effectiveness of conflict resolution and sanctioning mechanisms decrease. Therefore, property rights have contributed to the decline in irrigation water usage.

5 ALTERNATIVE FACTORS INFLUENCING THE PROCESS

Several other factors other than institutional issues also need attention when the problem of irrigation system abandonment is investigated. Among them are eventual water shortage in the region, changes to crop structures that require less water, unfavourable market conditions, and alternative water supply sources.

Water shortage. The agricultural producers in the region did not report any water shortages. According to the manager of both branches of Irrigation Systems Ltd., the water in the dams has declined because of insufficient snows and rainfalls. Since the agricultural water demand has also declined, the producers have not yet felt a shortage. Therefore, the water shortage has not been a factor causing the abandonment of the irrigation systems in the region. But it will start playing an important role in the near future.

Rural population. There were only a few villages where the rural population significantly declined after 1990[14]. In nearly all of the villages, however, the percentage of people close to retirement age is high. Older people have shorter lifetime horizons and they are less likely to make long term investments. Still, they could have interests in maintaining equipment. Therefore, the changes in the population and labour force can not explain the drastic decline in the irrigation water usage and irrigation systems abandonment.

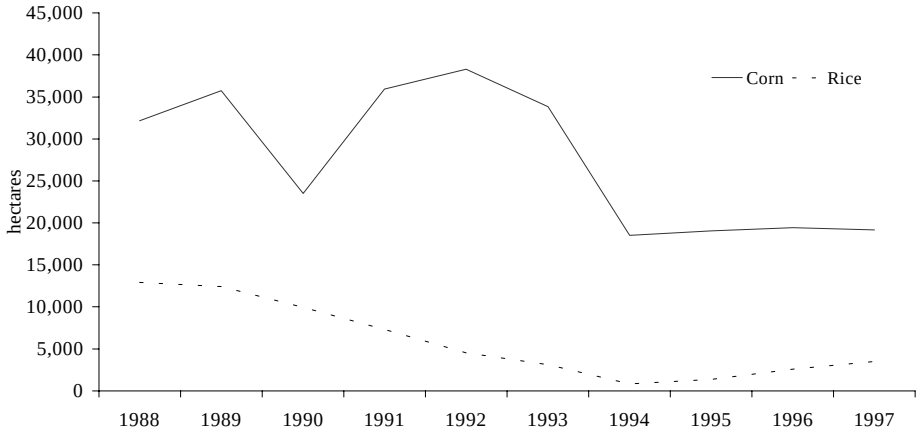
Changes in crop structure and market conditions. The areas growing perennial crops in the Plovdiv region have decreased significantly[15]. However, the main reason for this decrease was not irrigation, but the privatisation process. The areas growing wheat have been increasing. The areas hosting corn and rice, which require frequent irrigation, have decreased. Market conditions[16], but more so the instability of the water supply, have contributed to this change. One of the interviewed rice producers had seriously considered switching to cereals because of the irregularity of the water supply.

[14] In 1991 the rural population in the Plovdiv region was 429,700. In 1997 it was 424,312 (National Statistical Institute).

[15] Perennial crops decreased from 44,000 hectares in 1988 to 35,000 hectares in 1997 (National Statistical Institute).

[16] The number of animals has decreased, and so the demand for corn feed has also decreased.

Figure 2: Areas planted with corn and rice in the Plovdiv administrative region



Source: Statistical Yearbook of Bulgaria.

The trends of the areas growing vegetables are not as clear as the ones of cereals. Tomatoes and green pepper are the main vegetable crops for the region The areas planted with tomatoes have decreased, but those with green pepper have risen. The market conditions have played a decisive role in this situation. Pepper accounts for about 30% of the fresh vegetable export, while tomatoes is just 3%[17] (MZG).

Most of the interviewed complained about lower prices and the instability of the agricultural product markets, especially vegetables, and the import of agricultural products. "… Agricultural producers in the area make their production decisions blindly. They do not have any advance information about what the agricultural product prices would be in order to plan their crop structure……" (Manager of the water users association in Katunica). The export of agricultural products has also declined and the market has shrunk..

[17] Consumption is comparatively stable, about 30 kg tomatoes and 10 kg pepper per person.

Because the irrigation systems do not operate in some villages, people have started to grow more cereals, but less vegetables and corn (Kadievo, Chamukovi, Kochovo). In other cases, the changes in crop structure has been caused by other reasons[18]. These changes, along with the problems of irrigation, have contributed to the decline of the irrigation water usage (Padarsko, Ruvevo Konare, Malo Konare).

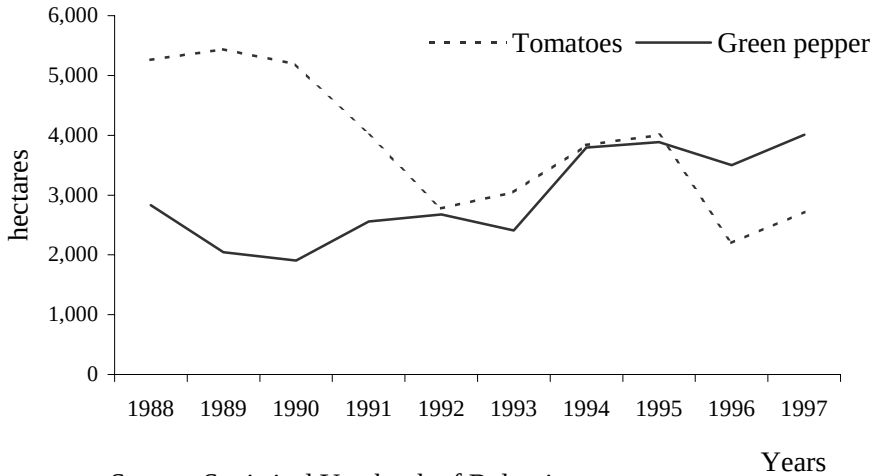
Most of the small agricultural producers do not have access to micro-loans. This constrains their opportunities to develop agricultural production. The banks are unwilling to provide loans for agriculture because of the high risk involved. The lack of credit mainly affects small agricultural producers.

During the interviews, evidence was gathered that a large part of the land was abandoned. This however, could not be seen from the data of the National Statistical Institute.

Therefore, the changes in crop structure have contributed to the decline of irrigation water usage. The areas which maintain crops sensitive to irrigation have decreased and the ones that do not require irrigation have increased. Causality of this change is not entirely clear; to define it would require a separate study itself.

The cost of pumping water[19]. The costs for drilling wells and then pumping water are considered, by most of those interviewed, to be higher than normal water prices. Moreover, the wells water is cooler compared to that of the canal, and may cause stress to the plants. Only small-scale farmers used pump irrigation as a main source of water supply. Several reasons were expressed by the interviewed for using water from wells. First, when the canal system does not operate, wells are the only source of water. Second, it is more convenient for the farmers to have water whenever they need it. Third, wells provide insurance for eventual problems with the water supply from the canals.

Figure 3: Areas planted with tomatoes and green peppers in the Plovdiv administrative region



Source: Statistical Yearbook of Bulgaria.

[18] A de ons.

[19] A small water pump costs about 1,000 Levs ($500 US), and the cost for drilling a well is about 30 Levs per meter.

Therefore, switching to water from wells as an alternative could not explain the systems' abandonment. Only in limited cases is irrigating from one's own well preferred to irrigating from the canals.

6 LOCAL-LEVEL REACTIONS

The previous sections have analysed the overall trends and problems regarding irrigation system abandonment. This section illustrates how people react to the situation. Three cases from the Plovdiv region are described: co-operation, the case of small water dams, and switching to alternative water supply sources.

Co-operation. Co-operation among agricultural producers is not yet well developed, but there are some signals that it may play an important role in the future. In the village of Katounica, the water users' association was established[20] in 1995 and registered according to the Co-operative Law. Presently it provides services to 1,500 hectares. About 300 hectares of land are irrigated each year. The irrigation system is fed with water from the Chepelarska river. A loan from the World Bank has been used to restore a small dam in the area. Now the association is able to meet debt payments to a certain extent. According to the chief executive of this organisation, the loan has helped tremendously; however, the establishment of the association has been mainly a people-driven process. A water-use schedule is being prepared in order to regulate water usage and water guards control it. No significant conflicts among water users were reported.

The water users' association in the town of Rakovski was established in 1995. It was also registered according to the Co-operative Law. The association serves 3,600 hectares of arable land, 3,000 of which are irrigated. There are seven small dams in the area. The local municipality owns both the internal canal system and the dams. Individuals rent the dams, which are used for irrigation and fishery. The association manages the internal canal system. There are three producers' co-operatives in the area and the association provides water to one of them. Water for irrigation is supplied by the firm Irrigation Systems Ltd., Plovdiv - North.

Informal co-operations of agricultural producers concerning irrigation also exist. In the village of Kourtovo Kunare, twenty agricultural producers have rented one field of about 4 hectares of land. Each of them cultivates his plot individually, but they co-operate in cleaning the internal canal system. In the village of Momino Selo, one person collects information about the crops and water needs of his neighbours. Then he presents this information to the local branch of Irrigation Systems, Ltd., and discusses with them the conditions of water supply. The informal co-operations of agricultural producers are not rear-occasion in the region. They exist very often in places with small irrigation systems.

Both of the formal water users' co-operatives operate under the Co-operative Law (1999), which does not transfer the ownership on the internal canal system[21] to them. However, they bear all costs for maintaining the systems and also get the benefits for using it. The situation is nearly similar in the case of the informal co-operations that

[20] Interview with the chief-executive.

[21] These rights are specified in the Water Users' Association Law (spring of 2001).

were observed. Though in this case the water users were paying the full water price instead of the preferential one.

The case of small water dams. Individuals rent most of the small water dams in the region. In the village of Padarsko, 40 km north-east from Plovdiv, an individual who cultivates about 100 hectares of corn and 100 hectares of wheat for seed has rented a water dam for nearly 10 years. In the past he has tried to drill a well, but he was unsuccessful in finding water[22]. The dam he rents serves his area and also 1.5 hectares which are cultivated by other producers. The price he charges is the same as that of Irrigation Systems, Ltd. He fills the dam during the winter, when water is cheaper. Aside from irrigation, he also uses the dam for fishery. According to him, there is enough water for fishery and irrigation, and therefore there is no room for conflicts. There were no complaints by the agricultural producers concerning the water supply organised by this individual.

In the village of Kochevo, 20 km south-east of Plovdiv, a local individual rented a dam to maintain a fishery. Soon after that, he was hired by Irrigation Systems, Ltd. –Plovdiv - South as a water guard. It is a comparatively large water dam, but it can provide water only to a small area around it. There are two main reasons for this, according to the tenant. First, the canal system is in bad condition, and second, there is a water shortage in the area. As a tenant, he owns the water in the dam up to a certain level that allows him to grow fish. As a guard of Irrigation Systems, Ltd., he is supposed to provide the water above this level to agricultural producers. He has strong incentives to control water usage. Both as a tenant and as a water guard, he is responsible for the quantity of water in the dam.

The small water dams cannot be used completely independently from the main irrigation systems, but they play an important role in balancing the water supply in the Plovdiv region. They are also used, in addition to the large dams, as water storage facilities. The relations between the tenants of the small water dams and the agricultural producers requires deeper investigation. When there is sufficient water there is no room for any conflict between both parties. The water circulation in dams is proper for the fish, as well as the irrigation. When water shortage exists conflicts are likely. Even though formal legislation gives priority to irrigation, the tenants of the dam have strong bargaining power since the water is under their control.

Pump irrigation. In two villages (Chalakovi, Kadievo,) all of the interviewed irrigate from wells. The irrigation systems in both places do not operate because essential parts of the equipment has been stolen. Until1990, the whole area (in both villages) was irrigated from the canals, but since the beginning of the transition period, the internal canal system deteriorated. Therefore, the agricultural producers were pushed, by the circumstances, to invest in wells and water pumps. Now, since they cultivate small plots, these investments have partially solved their problem. All of those interviewed though, consider their water pumps "weak," and not appropriate for supplying water to larger areas. One of them stated that his pump was broken, and because of financial difficulties, he was not able to replace it: "...with the money that I invested in the pump and the well, I

[22] This case could be interpreted as the strategy "Do-it-yourself" on a large scale similar to pump irrigation for the small agricultural producers.

could have paid for canal water for a long time; if, of course, there was water in the canal….".

In the village of Kochevo, all of those interviewed were also irrigating from wells because there was no water in the main canal. This canal had not been cleaned for at least one year. As a result, there was a significant decline in the ground water level. Therefore, pump-irrigation, while solving the problems in short run, may create new problems in the long run.

7 CONCLUSIONS

The purpose of the article was to investigate the factors that have contributed to the irrigation systems' abandonment in Bulgaria during transition. Two groups of issues have been considered: institutional and other issues. The study suggests that institutional factors have contributed to the problem. The irrigation systems in Bulgaria were built to serve large production units, but now they are supposed to provide water to many agricultural producers often with different interests.

Formal legislation is already in place, and it envisages transferring irrigation system management to the water users. The problem is that the existing institutional settings do not support self-governance. The social mechanisms still do not work, and the property right relations are not clarified at the local level. Co-operation among farmers exists, but it is not enough for the scale of the existing irrigation systems. The irrigation infrastructure is still controlled by the state or local municipality. The three main types of local response to the problems of irrigation suggest that the process of "clarifying" the property rights structure on the local level has began.

Among other factors, the change of crop structure induced by the instability of agricultural product prices and the irregularity of water supply have contributed to the irrigation systems abandonment. Water shortage has not been a factor causing the decline in irrigation water usage, but it could start playing an important role in the near future.

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